Data Management for Archaeological Researchers

Welcome

This is the Quarto website for the ADS Training manual - “Data Management for Archaeological Researchers”. Full metadata for this resource can be found in the ADS Training Portal.

Data Management for Archaeological Researchers
Data Management
ads Archaeology Data Service
UKRI Arts and Humanities Research Council

About this Guide

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Archaeology Data Service https://archaeologydataservice.ac.uk/

Author

Dr Nicky Garland, Archaeology Data Service

Acknowledgements

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Citation

Garland, N. (2026). *Data Management for Archaeological Researchers.* York: Archaeology Data Service [distributor]. DOI:

Introduction

Data is at the heart of the discipline of archaeology. As we increasingly create information that is “borne-digital”, the need to understand and effectively implement data management becomes a core skill, especially for archaeological researchers. This resource is designed to address the unique challenges archaeologists face in data management, including some specific archaeological case studies to demonstrate effective data management within the discipline.

This training manual provides an introduction to the necessary knowledge and skills to effectively manage data throughout the research life cycle. The course covers:

- good practice in data management
- open research practices
- effective and efficient planning
- documenting your data
- ensuring your data’s long term preservation

This resource will allow users to gain a comprehensive understanding of data management practices and learn how to apply them to their own research projects, including how to create a data management plan for their own research projects and research funding applications. This resource is focused specifically towards researchers in the discipline of archaeology but is equally applicable to all researchers in heritage fields.

Bres, E. E., & Bittner, C. (2024). A collection of AI generated images visualising various RDM aspects (1.0.0). Zenodo. https://doi.org/10.5281/zenodo.11147887

Who is this training resource for?

This resource is targeted to researchers from a range of different career stages, from early career researchers to more established and experienced Principal Investigators. Many of the concepts are relevant to doctoral research students, however, the focus of the training is on those who are leading and working in funded research projects

This resource is designed for those researchers who predominantly work in the

discipline of archaeology, however, many of the core concepts are relevant to any researchers whose research focuses on heritage more generally.

Learning Objectives

By the end of this resource, users will be able to:

1. Identify the basic principles of data management for heritage based subjects and the research sector more generally.
2. Understand what constitutes ‘good practice’ in data management.
3. Critically analyse and appraise data management plans created for research projects.
4. Compile a data management plan for your own funding applications.

Navigating this resource

We recommend working through this resource from beginning to end to build a comprehensive understanding of data management principles. However, we understand that you may sometimes need quick access to specific topics. The search bar allows you to search the entire resource and quickly locate particular subjects, tools, or techniques. However, please remember that many concepts are interconnected, and earlier sections often provide important context for later material.

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Introducing the Archaeology Data Service

The ADS is the leading accredited digital repository for archaeology and heritage data generated by UK-based fieldwork and research. Founded in 1996, the core activity of the ADS is the long-term digital preservation of the data entrusted to our care. To do this we follow a policy of active data management and curation to ensure the integrity, reliability and accessibility in perpetuity of all our data. All resources archived with the ADS are Open Access, and delivered through our website to facilitate re-use by the heritage sector and wider community.

To find out more about the organisation, the history of the ADS and our governance please visit the About pages on the ADS website.

The ADS Team

The ADS team is led by our Director, Professor Julian Richards, and Deputy Director, Dr Tim Evans, and consists of a large groups that covers:

- Management of collections development, research, training and communications
- Curatorial and Technical staff (otherwise known as CATs)
- Application and Systems Development team
- Administration and Finance team
- The editor of our sibling publication Internet Archaeology
- A rotating group of Interns

A full list of the ADS team can be found on the Team pages on the ADS website.

The ADS Team (Jenny O'Brien)

About the author

This guide was prepared by Dr Nicky Garland, ADS Training and Communications Manager. Nicky is an Archaeologist with a background in Iron Age and Roman Britain, archaeological theory and digital approaches to the past. He worked in developer-funded archaeology in the UK and Ireland for more than a decade before completing his doctoral research at the UCL Institute of Archaeology. He then worked as a Postdoctoral Researcher at the Universities of Leicester, Newcastle and Durham before joining the ADS in 2022. He has experience teaching and training in both developer-led archaeology and academia and now leads the ADS' efforts to provide training and communications to our users and key audiences.

If you have any queries about this resource please contact the ADS Helpdesk.

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Background

As part of infrastructure funding that we receive from the Arts and Humanities Research Council, the ADS undertook a survey to understand the current levels of research data deposition, which stands at approximately 20% of all funded projects. This survey was also designed to identify training needs were required to ensure data deposition, with a lack of skills and knowledge in data management highlighted as a key concern. Consequently the ADS designed and delivered free in-person training in data management practices to help researchers manage and deposit their research data with an accredited archive for long-term sustainability.

This version of this training resource was created following the initial phase of in-person training workshops, which were delivered in 2023 and 2024 to six different archaeology and classics departments from institutions from across the UK.

This resource has been created to both supplement the in-person training workshops and to widen access to this knowledge and skill base for researchers in the UK and beyond.

Further updates to this resource will appear in the future as new in-person sessions are undertaken. If you are interested in receiving this training in person or have any recommendations as to edits or additions to this resource please contact the ADS helpdesk.

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View source

1 Open Research

Open Research is the notion that our research should be as open and accessible as possible. The purpose of Open Research is:

> "to transform research by making it more reproducible, transparent, reusable, collaborative, accountable, and accessible to society". The Turing Way Community

Stemming originally from the term, Open Science, over the last 20 years the terminology has widened to include all research, as other disciplines including the humanities, saw the benefit of these approaches and the need for more inclusivity in the dissemination of our research.

> "Open research[….]relates to how research is performed and how knowledge is shared based on the principle that research should be as **open as possible**". UK Research and Innovation

This quote by the UKRI is useful in understanding how Open Research is viewed today. This defintion provides some practical considerations in making your research as open - that it should be as **open as possible**, rather than assuming that *all* of your research must be accessible. Practically speaking, it may not be possible in all cases, for your research data to be open. An example of this relates to personal data. In this case while this original data cannot be shared without permission, perhaps you could share either an anonymised version or just the results that stem from analysing that data.

1.1 Open Research and Research Funding

It is important to understand the growing movement towards Open Research in the UK as major funding bodies, including UK Research and Innovation (UKRI), are actively promoting these concepts as part of their key principles. Moreover, a number of UK based research organisations including Universities UK, Research Councils UK, the Wellcome Trust and the Higher Education Funding Council have signed the Concordat on Open Research data, which was created to *"ensure that the research data gathered and is made openly available for use by others wherever possible"*.

As such, future applications for research funding should take into account Open approaches (as outlined below) as in the future it may be that these principles are mandated in the design of research projects.

1.2 Open Research in Practice

How, in practice, do we make our research more open and accessible to all? There are three main ways in which this is achieved within a research environment.

1. Open Access: Making all published outputs created through our research, whether journal articles, monographs, or other, freely accessible for

maximum use and impact.
2. Open Data: Documenting and sharing research data, usually by depositing that data in an appropriate digital repository.
3. Open Methods: Documenting and sharing the processes, procedures and materials used to undertake research. This is usually undertaken in two ways:

- Open Source Software: Documenting research code and routines, and making them open and freely available.
- Open Hardware: Documenting designs, materials, and other relevant information related to hardware, and making them open and freely available.

1.3 Open Research for Archaeologists

How does Open Research relate to archaeology as a profession and why is it important for the sector? Open Research:

- **Improves our practice** - Open Research allows us to be more transparent and reproducible in the way that we undertake archaeological research, which will only help to improve standards across the profession.
- **Disseminates knowledge** - These approaches allow archaeologists to share our knowledge more widely, within academia but also with the general public, and helps to drive new research and innovation.
- **Fosters community** - Sharing our data, methods and outputs fosters a wider research community and enables collaboration both within and across disciplines.

The paper listed below, authored by Ben Marwick and others, provides background to the nature of Open Research in archaeology and some practical advice about how we can incorporate open access, methods and data into our own archaeological research.

Citation

Marwick, B, d'Alpoim Guedes, J., Barton, C. M., Bates, L. A., Baxter, M., Bevan, A., Bollwerk, E. A., Bocinsky, R. K., Brughmans, T., Carter, A. K., Conrad, C., Contreras, D. A., Costa, S., Crema, E. R., Daggett, A., Davies, B., Drake, B. L., Dye, T. S., France, P., Fullagar, R., Giusti, D., Graham, S., Harris, M. D., Hawks, J., Heath, S., Huffer, D., Kansa, E. C., Kansa, S. W., Madsen, M. E., Melcher, J., Negre, J., Neiman, F. D., Opitz, R., Orton, D. C., Przstupa, P., Raviele, M., Riel-Savatore, J., Riris, P., Romanowska, I., Smith, J., Strupler, N., Ullah, I. I., Van Vlack, H. G., VanValkenburgh, N., Watrall, E. C., Webster, C., Wells, J., Winters, J., and Wren, C. D. (2017) **Open science in archaeology**. *SAA Archaeological Record*, 17(4), pp. 8-14. DOI: https://doi.org/10.31235/osf.io/72n8g

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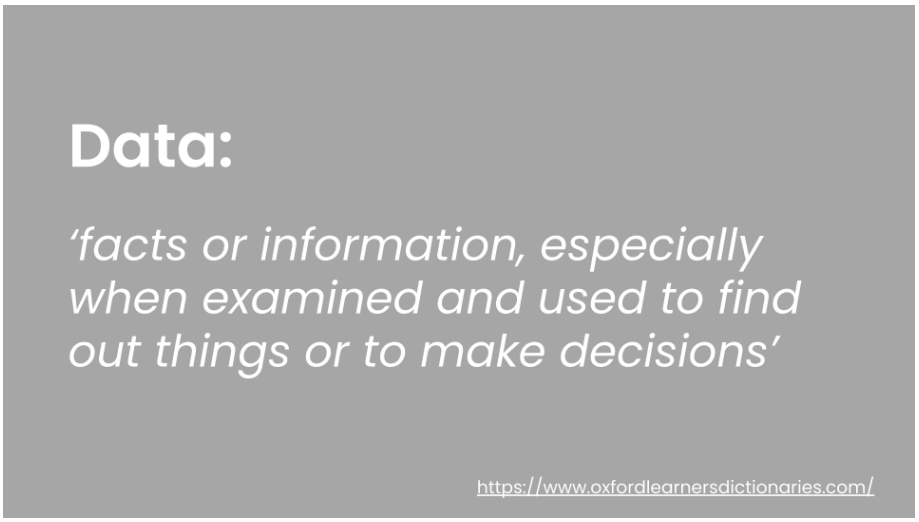
2 What is Data?

Before we can explore what we mean and understand about 'data management', we should start by discussing what we mean by archaeological 'data'. Archaeology as a discipline spans the humanities, social sciences and physical sciences. As such archaeologists are used to dealing with a variety of different data types.

The term data is defined in the Oxford Dictionary as:


Data:
'facts or information, especially when examined and used to find out things or to make decisions'
https://www.oxfordlearnersdictionaries.com/

What we consider data in archaeological research is actually quite broadly defined. In a basic sense, data is that which can be incorporated into a different research outputs. In reality any and all information that we create and use to examine things as part of your research could, and should, be considered data.

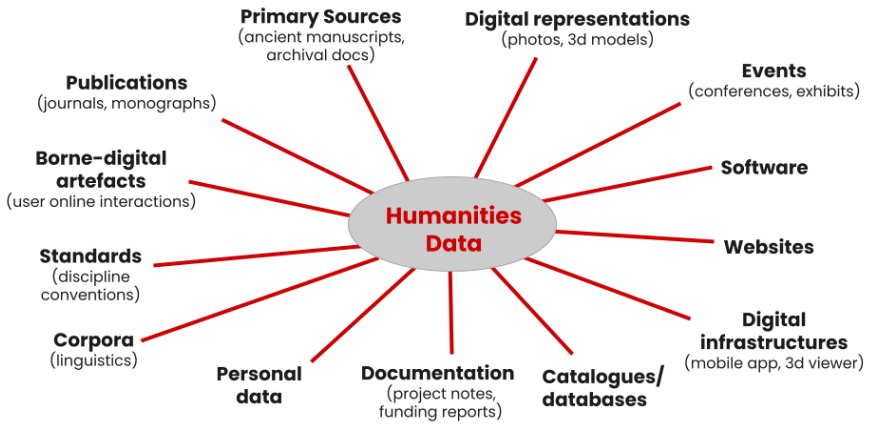
2.1 For the Humanities

In the humanities there is sometimes confusion within researchers about what they would or would not consider 'data', particularly between sub-disciplines. Where data is known and defined - in a scholarly sense - it tends to be focused in the humanities GLAM sector (Galleries, Libraries, Archives and Museums).

The article listed below, published in the Journal of Documentation by a group of Italian researchers, interviewed 19 researchers from the Department of Classical Philology and Italian Studies at the University of Bologna.

> Gualandi, B., Pareschi, L. and Peroni, S. (2023), "What do we mean by "data"? A proposed classification of data types in the arts and humanities", Journal of Documentation, Vol. 79 No. 7, pp. 51-71. DOI: https://doi.org/10.1108/JD-07-2022-0146

The purpose of the research was to shed light on the definition of the word "data" in the humanities domain. The graphic below provides the groupings defined by the article, which constitutes 13 different types, and provides a good assemblage of the different types of data that we create and collect in the humanities.



Some of these data types are relatively obvious and applicable to all researchers, such as **publications**, **primary sources**, **documentation** and **standards and guidance**.

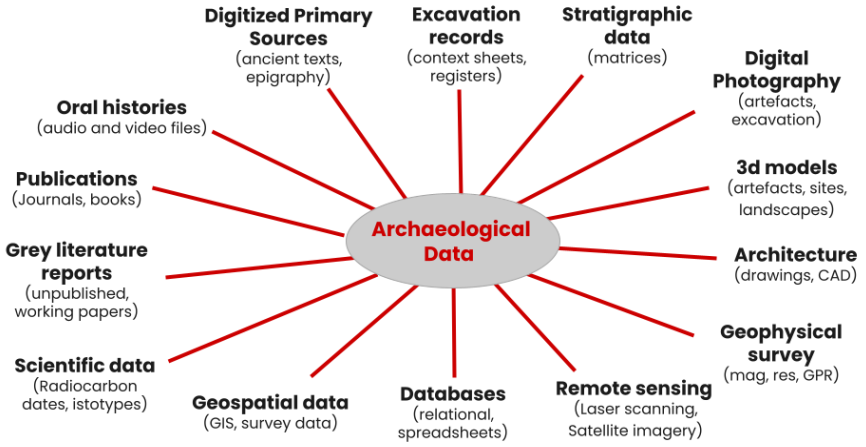
Some others are more digitally based, such as **catalogues/databases**, **websites**, **software**, **digital representations** (e.g. photos, 3d models) and **digital infrastructures** (e.g. a 3d model viewer or mobile app).

Other data types are perhaps less obvious, such as **events** (e.g. conferences, exhibitions, webinars, guided tours or training sessions), **borne digital artefacts** (which are different per discipline - more below) and **corpora**, which represents a searchable database of language samples specifically for linguistic research.

2.2 For Archaeology

Unfortunately, similar research has not yet been undertaken for archaeology as a discipline. However, below is an attempt to create a similar mapping exercise for archaeology, using research published in the Advances in Archaeological Practice about archaeological data collection (referenced below), and by crowd sourcing participants from the in-person version of this data management training course.

> Heilen, M., & Manney, S. (2023). Refining Archaeological Data Collection and Management. Advances in Archaeological Practice, 11(1), 1-10. DOI: https://doi.org/10.1017/aap.2022.41



Archaeological data types

Some data types above incorporate the elements that we see in the Humanities more generally, including **Primary Sources**, **Publications** and **Grey literature reports**.

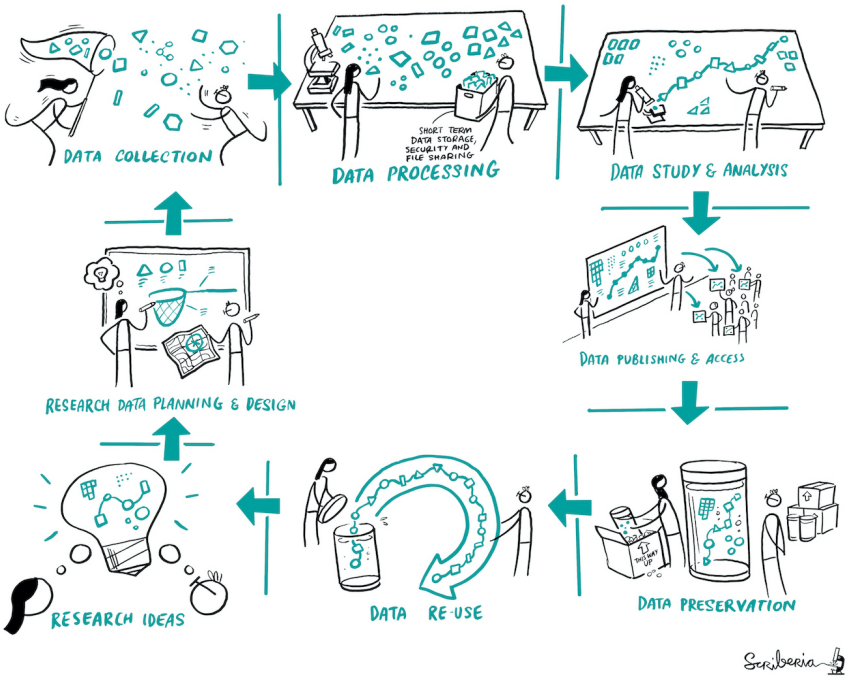
Other types are more specific to archaeological investigation including **Stratigraphic data**, **Excavation records** and **Geophysical survey**, while others relate more to historical periods, such as **Architecture** and **Oral histories**.

Interestingly there are a number of data types that relate specifically to digital sources including **3d models**, **Geospatial data** and **Remote sensing**.

What we are finding is that, over the last ten years, archaeological data is increasingly **borne digital**, by which I mean the digital records are the only resource we create as part of archaeological research that are unsupported by physical medium, such as paper records.

This exercise is to highlight the importance of proper data management but also to broaden our understanding of what data constitutes and what data may be useful for ourselves and others. Our research data is not just the outputs or end products of our research projects, but also includes much of the data that is produced along the way.

2.3 The Research Data Life Cycle



The Research Life Cycle: The Turing Way Community, & Scriberia. (2023). Illustrations from The Turing Way: Shared under CC-BY 4.0 for reuse. Zenodo. DOI: https://doi.org/10.5281/zenodo.7587336

Thinking about how we document or manage all of these different types of data can be quite overwhelming for many researchers. A useful way to visualise the flow of data within a research project is to consider how it forms part of what is called the 'research data life cycle'.

As shown in the image above, the research life cycle is the realisation that most research is not a discrete and linear project, despite the way we design them, but part of a larger and long term cycle. Over our research careers one project feeds into the next, building upon past knowledge and, vitally, our research data. Let's look at the stages in more detail.

2.3.1 The Early Stages

Many researchers will be familiar with many of the early stages of the research life cycle including **data collection**, **data processing** and **data study and analysis**. Already in these early stages when we consider data we can envisage how it is being transformed from raw data, to processed data to (probably) some sort of table or visualisation. Equally the next step, **data publishing and access**, is likely also familiar - the equivalent of writing the paper or book from your research and getting it published.

2.3.2 The Later Stages

The next steps are generally less well understood but vitally important; **data preservation** and **data reuse**. Following completion of your research these stages ensure the long term preservation of your datasets, or at least a subset of them (more later). Data reuse is an attempt to increase the impact of your research data, possibly by transforming your data into an accessible format and by making it as reusable as possible, for both others and for your own future research.

These steps are important because through organising and managing your data for the preservation and reuse stages, you can best utilise this data to drive and

direct the next stages of your research through **research ideas** and **research data planning and design**.

The video below by the UK Data Service provides a useful overview of the Research Data Life cycle including the actions associated with each of the stages listed above.

3 The Research Data Life Cycle in Practice - Starr Carr

So let's have a look at how the Research Data Life Cycle works in practice with an example from a relatively recent research project. The Star Carr Mesolithic Site is located in Yorkshire and dates to around 9000 BC. The site has seen sustained investigation and research by archaeologists from the University of York, most notably Professor Nicky Milner. The site consists of settlement activity situated around a prehistoric lake, which has led to the excellent preservation of artefacts within peat deposits.

3.1 Data Collection

Archaeological excavation was the primary mode of data collection at Star Carr, undertaken over a number of seasons starting initially in the 1980s by the Vale of Pickering Research Trust and later the Department of Archaeology at the University of York.

Staff and Students from the University of York excavating at Star Carr

3.2 Data Processing / Data Study and Analysis

Certain artefacts recovered from the site saw detailed analysis including a range of digital imaging techniques undertaken on engraved shale pendant, which represents the earliest known Mesolithic art in Britain. The analysis was subsequently published in Internet Archaeology.

> Milner, N., Bamforth, M., Beale, G., Carty, J.C., Chatzipanagis, K., Croft, S., Conneller, C., Elliott, B., Fitton, L.C., Knight, B., Kröger, R., Little, A., Needham, A., Robson, H.K., Rowley, C.C.A. and Taylor, B. 2016. *A Unique Engraved Shale Pendant from the Site of Star Carr: the oldest Mesolithic art in Britain*, Internet Archaeology 40. DOI: https://doi.org/10.11141/ia.40.8

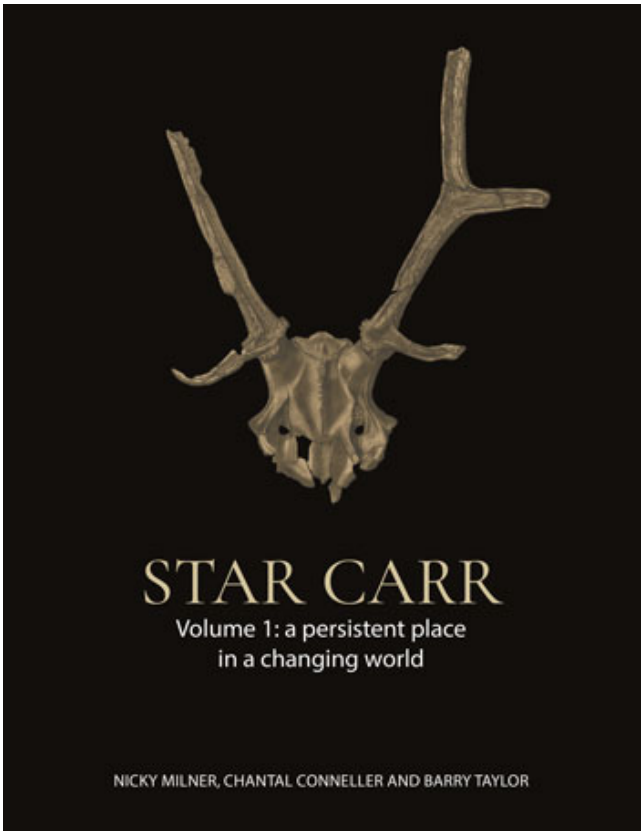
A mesolithic shale pendant recovered from Star Carr

3.3 Data Publishing and Access

The publication of the results of the excavations and analysis mentioned above led to a number of open access journals and volumes, including those listed below:

> Milner, N., Conneller, C. and Taylor, B. 2018a. Star Carr Volume 1: A Persistent Place in a Changing World. York: White Rose University Press DOI: https://doi.org/10.22599/book1

> Milner, N., Conneller, C. and Taylor, B. 2018b. Star Carr Volume 2: Studies in Technology, Subsistence and Environment. White Rose University Press DOI: https://doi.org/10.22599/book2



The Star Carr Open Access volume

3.4 Data Preservation

Alongside the publications, the excavation records, specialist reports, and unpublished reports were archived with the Archaeology Data Service

> University of York. 2018. Star Carr and Lake Flixton archives data-set. York: Archaeology Data Service. distributor. DOI: https://doi.org/10.5284/1041580

3.5 Data Reuse

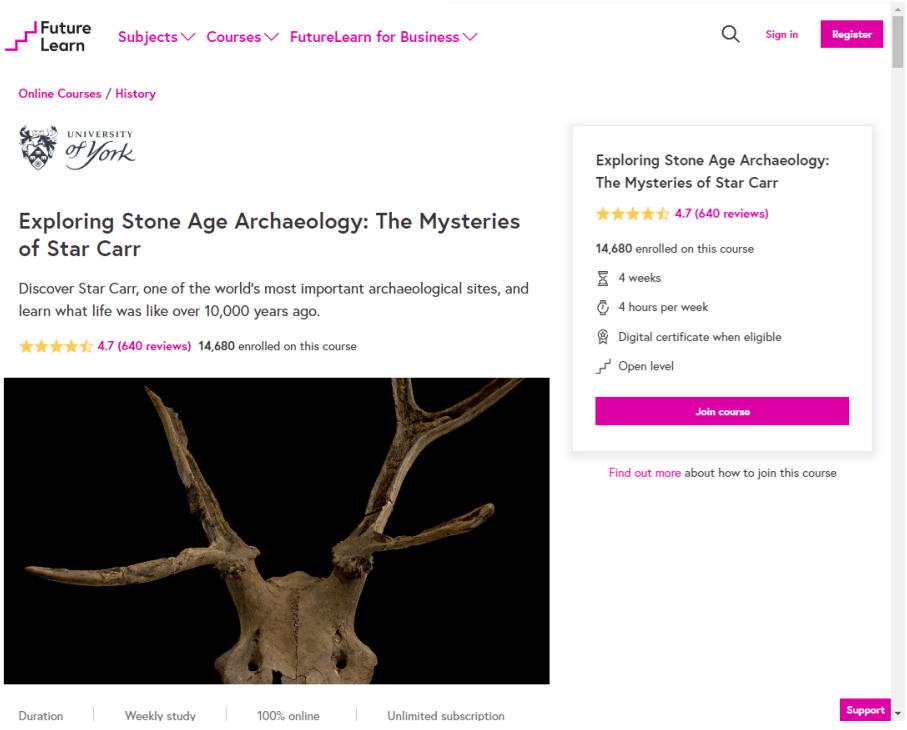
Some of the earlier excavation data was digitised as part of the Star Carr Archives project. This data was reused to support the later phase of excavations and contribute to the wider understanding of the site (this data was also archived on the ADS)!

> Nicky Milner, Hayley Saul, Ben Elliott (2013) Star Carr Archives Project [data-set]. York: Archaeology Data Service [distributor] DOI: https://doi.org/10.5284/1019856

A reconstruction drawing of the Star Carr site

3.6 Research Ideas / Research Data Planning and Design

The outputs of these projects fed into a number of new projects that focused on public outreach. This includes teaching resources for schools, a Massive Online Open Course (MOOC) called Exploring Stone Age Archaeology: The Mysteries of Star Carr and, more recently, an exhibit at the Yorkshire Museum.


Future Learn
Subjects
Courses
FutureLearn for Business
Sign in
Register
Online Courses / History
UNIVERSITY of York
Exploring Stone Age Archaeology: The Mysteries of Star Carr
Discover Star Carr, one of the world's most important archaeological sites, and learn what life was like over 10,000 years ago.
4.7 (640 reviews) 14,680 enrolled on this course
Exploring Stone Age Archaeology: The Mysteries of Star Carr
4.7 (640 reviews)
14,680 enrolled on this course
4 weeks
4 hours per week
Digital certificate when eligible
Open level
Join course
Find out more about how to join this course
Duration
Weekly study
100% online
Unlimited subscription
Support

A screenshot of the Star Carr Massive Online Open Course

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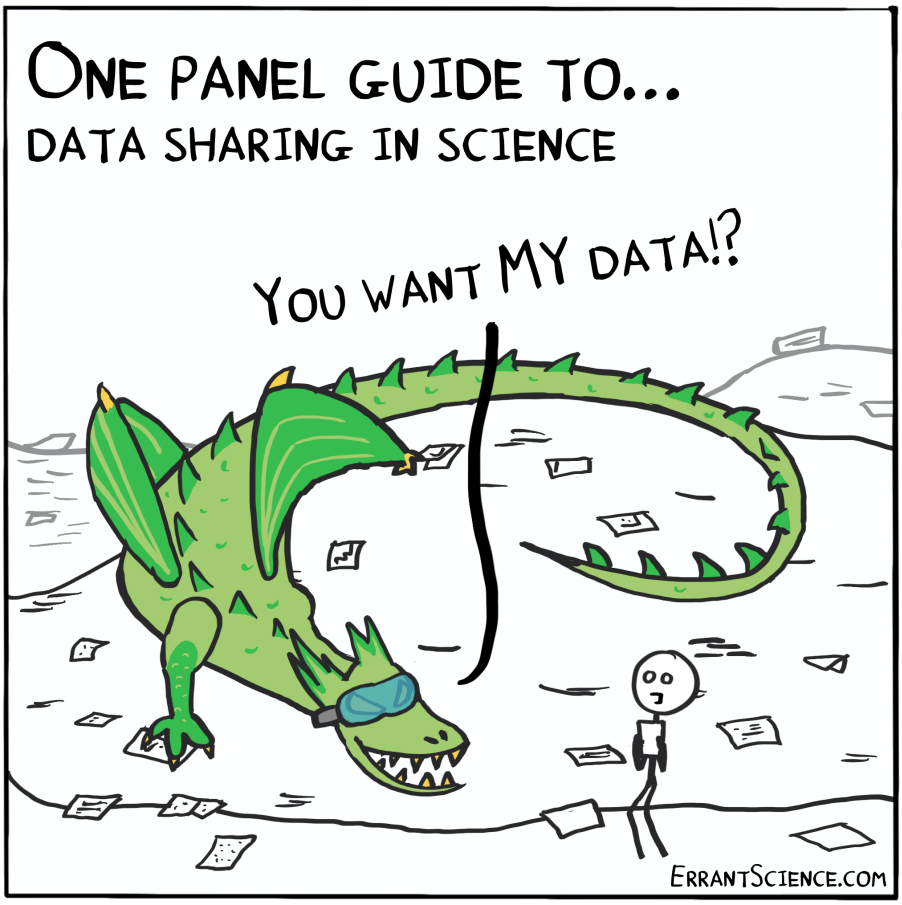
4 Data Sharing

This section considers the practicalities of data sharing and how it may affect your research.

4.1 Barriers to Sharing Data

Before we discuss the benefits of data sharing it is important to recognise that this is a straightforward process. The reality of the research environment is one where the researchers compete for limited funding grants and therefore the thought of data sharing may, understandably, cause some apprehension.



Errant Science Cartoon

There are a number of other barriers to data sharing too. They include

- Cost - Having the finances in place to pay for open access publications and the deposition of data in digital repositories.
- Lack of Time - Having enough time to properly organise and deposit your research data.
- Organising data is challenging - Dealing with large datasets can be challenging to facilitate its preservation and reuse (more later on).
- Digital literacy - Having sufficient digital skills to properly manage and archive your research data.
- Uncertainty about copyright, licensing and data protection - It is difficult to navigate the multitude of issues that need to be overcome when sharing your data.

- Repository choice - Being unsure which digital repository is the best one to choose for your data (more on this later).
- Cultural challenges - Some (sub)disciplines are more accepting of data sharing than others.
- Trust - Ensuring that the organisations and institutions that will help you share your data are trustworthy.

This whitepaper, listed below, reports on one of the largest surveys of researchers about research data (with over 7,700 respondents) and discusses the challenges that researchers face in sharing their data.

> Stuart, D. et al (2018). Whitepaper: Practical challenges for researchers in data sharing. Figshare. Journal contribution. DOI: https://doi.org/10.6084/m9.figshare.5975011.v1

4.2 Why share your data? The carrot and the stick

Now, in an effort to convince you to consider sharing your research data, let's consider the reasons why it is an important facet of your research. This can be broken down into the two following categories; which we nickname the 'Carrot' and the 'Stick'.

1. The tangible benefits from sharing data from your research (the carrot)
2. The negative consequences that will come with not sharing your data (the stick)

Let's start with the negatives first, the Stick

Requirement for research funding applications - As mentioned earlier we are increasingly seeing that funding agencies are requiring recipients to share research outputs as part of their grant requirements.

REF requirement - REF Guidance (for 2021 at least) requires that researchers deposit a copy of their research outputs within their institutional repository (or similar) for it to be counted within the REF submission.

Professional standards - Some discipline specific professional organisations are also encouraging the sharing of data as part of their research. An example is the Chartered Institute of Archaeologists (CIfA).

Ethical considerations - This is the notion that publicly funded research, funded at least in part through taxation and investment, should be publicly available to all.

Now let's consider the positives, The Carrot

Visibility of your research - A more open, findable and accessible dataset will be visible to a much wider audience than those outputs found purely in traditional scholarly publications and outlets, increasing the impact of your research.

Encourages collaboration - By ensuring that your resources are more widely

available, you are encouraging other researchers to collaborate with you. Open access ensures others are able to observe, use and hopefully build on your research data.

Supports integrity & replicability - By asking researchers to share our data, it forces them to start thinking about how that data is viewed by other researchers and whether your results can be replicated.

Research can advance quicker - With the data easily available to others, research that builds on earlier results can be undertaken more easily and at a much faster pace.

Improves digital literacy - To properly and efficiently manage and share our data, researchers will need to learn new digital skills. These skills will not only allow us to share our data but also improve the quality of our research overall.

Boosts citations - Research has shown that outputs available as open access resources are cited more often. This is what is often referred to as the Open Access Citation Advantage. Advantages are different for different disciplines but in most cases provide a higher citation rate and equally receive a more diverse range of citations from other disciplines and countries. More information can be found in the two papers listed below:

> Tennant J.P. et al. 2016. The academic, economic and societal impacts of Open Access: an evidence-based review. F1000Research, 5:632 DOI: https://doi.org/10.12688/f1000research.8460.3

> Huang, CK., Neylon, C., Montgomery, L. et al. Open access research outputs receive more diverse citations. Scientometrics 129, 825–845 (2024). DOI: https://doi.org/10.1007/s11192-023-04894-0

Wider impact (e.g. media, policy) - If you want your research to have a greater impact, either in the media or as part of governmental policy, then open access resources will be more widely shared and used in this spheres. Did you know that UK government departments do not have subscriptions to paywall journals?

This paper below, written by Biology researchers in the open access publication eLife, provides further details on the benefits of open scholarship practices for researchers.

> McKiernan, E.C. et al (2016) Point of View: How open science helps researchers succeed eLife 5:e16800 DOI: https://doi.org/10.7554/eLife.16800

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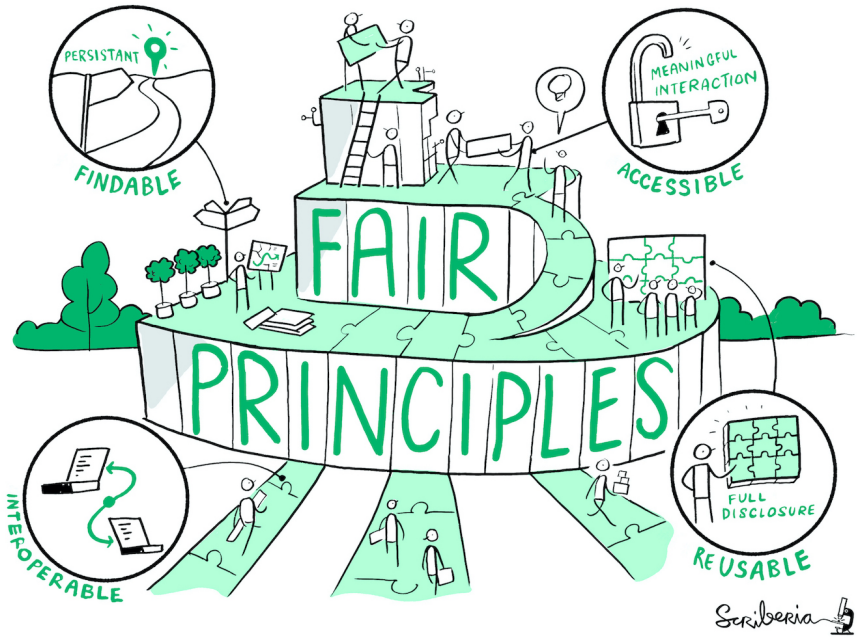
5 The FAIR Data Principles



The FAIR Data Principles: The Turing Way Community, & Scriberia.(2023). Illustrations from The Turing Way: Shared under CC-BY 4.0 for reuse. Zenodo. DOI: https://doi.org/10.5281/zenodo.7587336

So what makes our data 'Open' and how do we facilitate it being open to all? This can be summarised by what is called the FAIR Data principles.

The FAIR data principles is a series of four interlinked principles that work together to ensure that knowledge we discover throughout our research is integrated and reused by the wider community (either researchers or the general public) beyond the lifetime of a discrete project.

FAIR stands for:

- Findable
- Accessible
- Interoperable
- Reusable

The FAIR Data Principles provide a concise and measurable set of principles that can be put into practice within our research. These four aspects each provide a method to break down how we should go about making our data open as possible.

The paper below links to the original discussion of the FAIR Data Principles for data management. Although it relates more specifically to scientific data, it provides a useful source of information for understanding the background to this concept.

> Wilkinson, M., Dumontier, M., Aalbersberg, I. et al. (2016). The FAIR Guiding Principles for scientific data management and stewardship. Sci Data 3, 160018. DOI: https://doi.org/10.1038/sdata.2016.18

5.1 FAIR Data in theory....

How does FAIR data work in theory? Consider the questions below when it comes to your own research data.

- Findable - Are you (and others) able to find your data?
- Accessible- Once a user has found it, how do they access it? Is it open source?
- Interoperable - Is your data integrated with other sources (within a larger catalogue) and can it be used with other workflows?
- Reusable - Is your data well described so that it can be used, combined, and extended in different settings?

5.2 FAIR Data in practice....

And how does FAIR data work in Practice? Think about the methods below and how you could apply them to your research data.

- Findable: Use persistent identifiers, such as a DOI for objects or an ORCID for people. Add appropriate metadata to your data and make your data available via searchable resources (e.g. the Ariande Portal).
- Accessible: Make your data freely available as an open access resource and make your data preserved for the long term in a digital repository (more on this below).
- Interoperable: Use standardised vocabularies when describing your data, such as FISH (Forum on Information Standards in Heritage) or the Getty AAT (Art & Architecture Thesaurus).
- Reusable: Ensure that your data is issued with a data licence and includes necessary descriptive and contextual information for reuse (perhaps consider writing a data paper).

The paper below by Emma Karoune and Esther Plomp, both contributors to the Turing Way, is a detailed explanation on how you can share your archaeological data and make it more reproducible. The paper contains some practical solutions and a glossary of terms, which makes it a really valuable resource.

> Karoune, E., and Plomp, E. (2022) Removing Barriers to Reproducible Research in Archaeology. Zenodo, ver. 5 peer-reviewed and recommended by Peer Community in Archaeology. DOI: https://doi.org/10.5281/zenodo.7320029

5.3 Digital Repositories

Ensuring your data is FAIR may feel a bit overwhelming, depending on the size of your project and the types of data you may be working with. The good news is that Digital Repositories are available to assist you and provide services to ensure your data is Findable, Accessible, Interoperable and Reusable.

The purpose of a Digital Repository (sometimes also referred to as a data archive) is:

- To collect, store and preserve digital data.

- Ensure that each archive is accompanied by rich metadata (data that provides information on your data).
- Catalogue archives using persistent identifiers, such as DOIs.
- Create standardised practices for the collection and preservation of different data types.

When considering which archive may be the best for your data it is important to note that there are a number of different repositories for different types of data. Repositories can vary based on discipline, geographic location or data type.

Here are a number of different repositories that may be useful for archaeological research data:

- ADS - The Archaeology Data Service is the leading accredited digital repository for archaeology and heritage data generated by UK-based fieldwork and research. Founded in 1996 the ADS provides discipline specific expertise to a wide range of data types used in archaeology.
- tDAR - The Digital Archaeological Record is based in the US but is an international digital repository for the digital records of archaeological investigations.
- Figshare - Figshare is an online open access repository where researchers can preserve and share their research outputs, including figures, datasets, images, and videos. In some instances Universities have adopted a version of Figshare for their own institutional repository.
- Zenodo - An Open source repository originally commissioned by the European Commission providing a catch-all open repository for EC funded research. Built and developed by researchers, “to ensure that everyone can join in Open Science”. The repository is a free to use and growing repository for researchers and is very useful in uploaded presentations and documentation from your research project.
- Institutional repositories - Many universities now host their own institutional data repository (an example from the University of York). If you are a researcher in a University you have likely been encouraged to upload your publication preprints in your University repository for the purposes of REF. These types of repositories are usually free to use (depending on the quantity of data you want to archive), however, they will usually not be able to provide discipline specific requirements.

If you are interested in how the ADS makes our data FAIR, please read this page on FAIR Data on the ADS website.

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6 Case Study: The FeedSax Project

Below is an example of a recent archaeological research project and how they approached making their data and other outputs FAIR, in collaboration with the ADS.

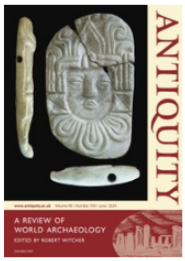
The Feeding Anglo-Saxon England Project was a European Research Council (ERC) funded project led by Professor Helena Hamerow between 2017 and 2022. The project examined bioarchaeological data, such as animal bones and paleoenvironmental remains, alongside evidence from settlement archaeology to better understand the growth of population and arable farming in England between 8th and 13th centuries.

The Feeding Anglo-Saxon England Project

6.1 Typical Research Outputs

The project produced a number of research outputs including several articles and books (listed below). These include a paper in the journal Antiquity, a paper in the journal Journal of Archaeological Science and a collected volume published in Liverpool University Press. Vitally, all of these outputs are **Open Access** and are free for all to download and read.

> Hamerow, H., Bogaard, A., Charles, M., Ramsey, C., Thomas, R., Forster, E., Holmes, M., McKerracher, M., Neil, S. and Stroud, E. 2019. Feeding Anglo-Saxon England: The bioarchaeology of an agricultural revolution. Antiquity, 93(368), DOI: https://doi.org/10.15184/aqy.2019.2710.15184/aqy.2019.27



Antiquity

Article contents

Abstract
The 'FeedSax' project
Preliminary results
References

Feeding Anglo-Saxon England: the bioarchaeology of an agricultural revolution

Published online by Cambridge University Press: **10 April 2019**

Helena Hamerow, Amy Bogaard, Mike Charles, Christopher Ramsey, Richard Thomas, Emily Forster, Matilda Holmes, Mark McKerracher, Samantha Neil and Elizabeth Stroud

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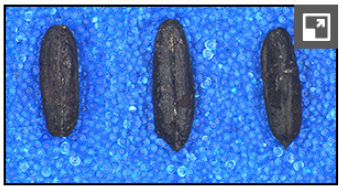
Abstract



The early Middle Ages saw a major expansion of cereal cultivation across large parts of Europe thanks to the spread of open-field farming. A major project to trace this expansion in England by deploying a range of scientific methods is generating direct

Article in Antiquity

> Stroud, E., Charles, M., Bogaard, A. and Hamerow, H. 2023. *Turning up the heat: Assessing the impact of charring regime on the morphology and stable isotopic values of cereal grains*, Journal of Archaeological Science 153, DOI: https://doi.org/10.1016/j.jas.2023.105754

Journal of Archaeological Science
Volume 153, May 2023, 105754

Turning up the heat: Assessing the impact of charring regime on the morphology and stable isotopic values of cereal grains

Elizabeth Stroud, Michael Charles, Amy Bogaard, Helena Hamerow

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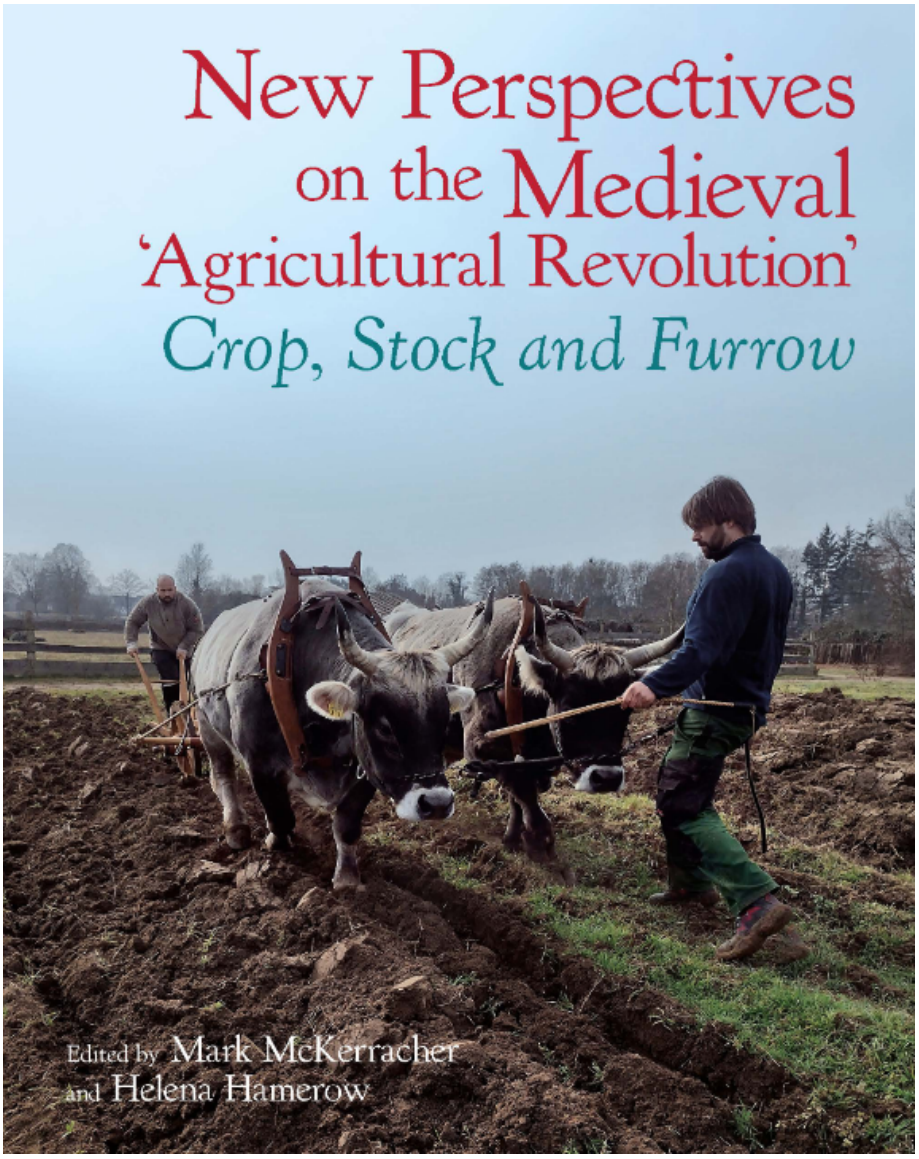
The experimental heating of rye, oat, spelt, wheat and barley between 215 and 300°C: the stable carbon and...
Data in Brief, Volume 50, October 2023, Pages 109544
Elizabeth Stroud, Michael Charles, Amy Bogaard, Erika Nitsch, Helena Hamerow

Article in Journal of Archaeological Science

> McKerracher, M. & Hamerow. H. (eds) 2022. New Perspectives on the Medieval 'Agricultural Revolution'. Liverpool University Press. https://library.oapen.org/handle/20.500.12657/58568



Volume in Liverpool University Press

6.2 Research Data Outputs

In addition to these more 'traditional' outputs, the project also made wider use and availability of the research that they conducted. The project created several large datasets, which they have also made available for use beyond the life of the project.

An ADS Archive - A searchable and downloadable national database of quantitative bioarchaeological evidence from excavated sites across England, spanning the 7th to 13th centuries AD. Available as an Open Access resource via a Creative Commons Licence.

> Mark McKerracher, Amy Bogaard, Christopher Bronk Ramsey, Michael Charles, Emily Forster, Helena Hamerow, John Hodgson, Matilda Holmes, Samantha Neil, Tina Roushannafas, Elizabeth Stroud, Richard Thomas (2023) Digital Archive for Feeding Anglo-Saxon England (FeedSax): The Bioarchaeology of an Agricultural Revolution, 2017-2022 data-set. York: Archaeology Data Service distributor. DOI: https://doi.org/10.5284/1057492

ads Archaeology Data Service

ADS Main Website | Back to Archives Search | Help

Digital Archive for Feeding Anglo-Saxon England (FeedSax): The Bioarchaeology of an Agricultural Revolution, 2017-2022

Mark McKerracher, Amy Bogaard, Christopher Bronk Ramsey, Michael Charles, Emily Forster, Helena Hamerow, John Hodgson, Matilda Holmes, Samantha Neil, Tina Roushannafas, Elizabeth Stroud, Richard Thomas, 2023. https://doi.org/10.5284/1057492. How to cite using this DOI

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Introduction

This collection comprises the digital archive for Feeding Anglo-Saxon England (FeedSax): The Bioarchaeology of an Agricultural Revolution.

FeedSax
Feeding Anglo-Saxon England
The Bioarchaeology of an Agricultural Revolution

FeedSax project logo, copyright FeedSax

Between the 8th and 13th centuries, the population of England grew to unprecedented levels. This could not have happened without a major expansion of arable farming, a development that culminated in the emergence of open-field agriculture. As well as feeding more people, the production of large cereal surpluses sustained the growth of towns and markets, and fuelled wealth inequality and the rise of lordship. Early medieval England thus witnessed a golden age of arable farming, in which the expansion of cultivation - 'cerealisation' - was the bedrock of demographic and economic growth. How, when and why this transformation occurred are some of the most enduring questions in British agricultural history, but more than a century of landscape-historical research has failed to produce a consensus.

The 'Feeding Anglo-Saxon England' (FeedSax) project addressed these longstanding conundrums by combining bioarchaeological data with evidence from settlement archaeology. Funded by the European Research Council under the European Union's Horizon 2020 programme (Advanced Grant 741751), the project ran from 2017 to 2022 at the Universities of Oxford and Leicester. The research team applied a suite of science-based techniques - including stable isotope analysis, functional weed ecology, animal palaeopathology and radiocarbon dating - to preserved grains, seeds, animal bones and pollen, to generate the first direct evidence for how crops were grown in this transformative period of history.

For further information, see the accompanying Internet Archaeology paper:
McKerracher, M. et al. 2023. *Feeding Anglo-Saxon England: a bioarchaeological dataset for the study of early medieval agriculture.* Data paper, Internet Archaeology 61. https://doi.org/10.11141/ia.61.5

The Digital Archive for FeedSax Project

A University of Oxford Archive - A large library of more than 6,000 photographs of charred grain saved in the University of Oxford institutional repository. This visual database of the grains used in destructive analysis is useful for other researchers and specialists as a reference collection.

> Hamerow, H. et al. 2023. Feeding Anglo-Saxon England grain photographs. University of Oxford. Collection. DOI: https://doi.org/10.25446/oxford.c.6641474.v3

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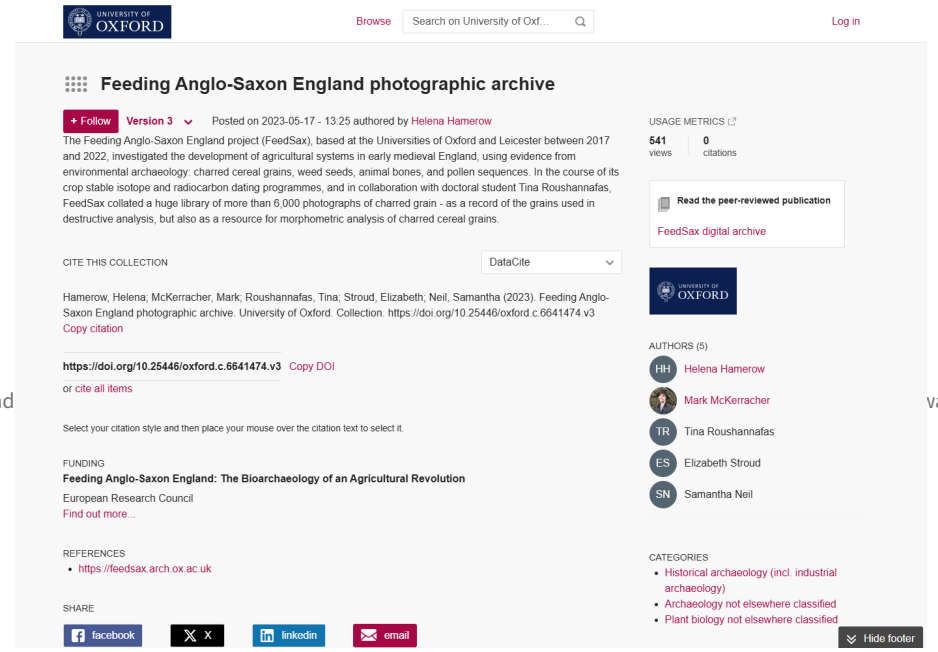
Browse
Search on University of Oxf...
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Feeding Anglo-Saxon England photographic archive
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Version 3
Posted on 2023-05-17 - 13:25 authored by Helena Hamerow
The Feeding Anglo-Saxon England project (FeedSax), based at the Universities of Oxford and Leicester between 2017 and 2022, investigated the development of agricultural systems in early medieval England, using evidence from environmental archaeology: charred cereal grains, weed seeds, animal bones, and pollen sequences. In the course of its crop stable isotope and radiocarbon dating programmes, and in collaboration with doctoral student Tina Roushannafas, FeedSax collated a huge library of more than 6,000 photographs of charred grain - as a record of the grains used in destructive analysis, but also as a resource for morphometric analysis of charred cereal grains.
USAGE METRICS
541 views
0 citations
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FeedSax digital archive
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DataCite
Hamerow, Helena; McKerracher, Mark; Roushannafas, Tina; Stroud, Elizabeth; Neil, Samantha (2023). Feeding Anglo-Saxon England photographic archive. University of Oxford. Collection. https://doi.org/10.25446/oxford.c.6641474.v3
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X
linkedin
email
AUTHORS (5)
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Mark McKerracher
Tina Roushannafas
Elizabeth Stroud
Samantha Neil
CATEGORIES
Historical archaeology (incl. industrial archaeology)
Archaeology not elsewhere classified
Plant biology not elsewhere classified
Hide footer

The Feedsax photographic archive

A Data paper - A short academic paper published in Internet Archaeology that explains the context for both of these databases, why they are useful, for whom and in what way.

> McKerracher, M. et al. 2023 Feeding Anglo-Saxon England: a bioarchaeological dataset for the study of early medieval agriculture (Data paper), Internet Archaeology 61. DOI: https://doi.org/10.11141/ia.61.5

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Feeding Anglo-Saxon England: a bioarchaeological dataset for the study of early medieval agriculture (Data paper)
Mark McKerracher, Helena Hamerow, Amy Bogaard, Christopher Bronk Ramsey, Michael Charles, Emily Forster, John Hodgson, Matilda Holmes, Samantha Neil, Tina Roushannafas, Elizabeth Stroud and Richard Thomas
Cite this as: McKerracher, M. et al. 2023 Feeding Anglo-Saxon England: a bioarchaeological dataset for the study of early medieval agriculture (Data paper), Internet Archaeology 61. https://doi.org/10.11141/ia.61.5
Summary
Botanical survey in the open fields at Laxton, Nottinghamshire (Image credit: Feeding Anglo-Saxon England project)
The FeedSax project combined bioarchaeological data with evidence from settlement archaeology to investigate how, when and why the expansion of arable farming occurred
Corresponding author: Helena Hamerow
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Sustainable Digital Scholarship service, University of Oxford
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Christopher Bronk Ramsey
School of Archaeology, University of Oxford
Michael Charles
School of Archaeology, University of Oxford
Emily Forster
Department of Archaeology, University of

Feedsax Data paper

7 Research Data Management

Research Data management is:

> "the active curation of data throughout the research lifecycle". University of York

7.1 Importance of Data Management

Why is data management so important for your research project?

- It saves you time and resources by avoiding the duplication of effort
- It allows you to provide consistency in data handling across your project
- It provides mechanisms to validate your analysis and ensures research integrity
- It helps to facilitate the long term preservation of your research datasets
- To make your data FAIR (see above)
- By planning ahead there is a greater chance of re-use (by you and others)

7.2 Effective Data management planning

There are a lot of things to consider when you are considering how to effectively manage your research data. Essentially there are two key tasks to complete: **understanding** your data and **organising** your data.

To break this down, the questions below are things you should ask yourself to see if you are effectively understanding and organising your data.

Understanding your data

- What is its **Purpose?**
- What is its **Content?**
- What is the **Method of Creation?**
- What **Attributes** does the data have?
- What **Relationships** does the data have?
- What **Constraints & Dependencies** does the data have?

Organising your data

- What is your **File Structure?**
- How do you define your **File names?**
- How do you organise **Version Control?**
- What is your **Discard policy?**
- What are your **Backup and Security policies?**
- What **Documentation** do you need to create?

The easiest and clearest way to approach your data in this way is to create what is called a data management plan (or DMP).

7.3 Develop a Data Management plan

What is the purpose of a data management plan?

> "A data management plan helps achieve optimal handling, organising, documenting and enhancing of research data. It is particularly important for facilitating data sharing, ensuring the sustainability and accessibility of data in the long-term and allowing data to be reused for future research."
> **UK Data Service**

In basic terms, a Data Management Plan is an **iterative** document describing how you plan to manage the **data** gathered through the delivery of a specific project, and what will happen to that data **once the project is complete**.

The key aspects here are:

- A DMP is *iterative*, by which is changes and develops as the research project progresses
- That the DMP should include all of the data gathered by the projects, which as we discussed earlier, could include a lot of different data types from different stages of your project
- That you should consider what happens to the data once your project is completed - can and should you preserve that data for the future?

A good definition of what a data management plan is and what it does is provided by the UK Data Service.

7.3.1 Seven key areas of a Data Management Plan

The requirements for Data Management Plans can vary between funding bodies (more below), but overall there are seven key areas of any DMP.

- Context
- Roles and Responsibilities
- Data Description
- Standards and Methods
- Ethics and IPR
- Sharing, Access and Security
- Preservation and Access

> ⓘ **Note**
>
> The titles listed above might be slightly different in different organisations but these seven headings are broadly applicable across all research institutions and funding bodies.

7.3.2 Context

- Project name
- Unique identifiers (e.g. DOI)
- Name of Funding bodies,
- Creation and edited date of the document
- Version number

- Any related policies/documentation

7.3.3 Roles and Responsibilities

- Responsible person(s)
- Roles for activities within the Data Management Plan
- Names and roles of any Collaborative partners
- Details of any agreements and/or contracts between partners

7.3.4 Data Description

- What data types/formats will be collected as part of the research
- Volume/size of data collected
- Software used for research and justification for each
- Details about any existing data that is being collated

7.3.5 Standards and Methods

- Method of data collection/creation
- Discipline specifics for data standards and methodologies
- Data structure
- Version control for data
- Quality assurance
- What metadata will be collected

7.3.6 Ethics and IPR

- Copyright holders
- Data sharing agreements
- Ethical considerations/reviews undertaken
- Personal/sensitive data
- How are you compliant with appropriate legislation
- Data sharing restrictions

7.3.7 Sharing, Access and Security

- Appropriate storage provision
- Security/backup procedures
- Data recovery procedures
- Control access and transfer between collaborators.

7.3.8 Preservation and Access

- Selection strategy
- What will happen to data not selected
- Details of data relationship to Publication or Dissemination
- Where will your data be deposited and why
- Data licence
- Future reuse

8 Exercise 1 - Review Data Management Plans

In this exercise you will examine several real world data management plans for archaeological research projects.

The aim of the exercise is to get you familiar with the structure and content of a typical data management plan and to consider what elements you may or may not include in your own DMPs to make them as clear and robust as possible.

Read one or more of the data management plans (DMPs) listed below.

Then consider the pros and cons of this data management plan.

- What aspects of the plan do you think was useful or well crafted?
- What aspects of the plan did you feel were unnecessary or unhelpful?

8.1 List of Data Management Plans with context:

ArchAIDE (ARCHaelogical Automatic Interpretation and Documentation of cEramics)

An EU Horizon 2020 funded project that aimed to create a new system for the automatic recognition of archaeological pottery from excavations around the world. The ArchAIDE project developed a new app meant to serve the global practice of archaeology, using the latest automatic image recognition technology to aid in the identification of ceramics.

Download the data management plan

Project Nivica Archaeology

This project focuses on archaeological exploration and community development in the Kurvelesh region of Albania, specifically around the village of Nivica. This project integrates cutting-edge three-dimensional recording and reconstruction techniques from the planning stage through the entire life cycle of archaeological investigations.

Download the data management plan

Great Hampden St Mary Magdalene: Archaeological Evaluation - December 2021

An archaeological evaluation at the church of St Mary Magdalene, Great Hampden, Buckinghamshire. This work was undertaken by John Moore Heritage Services in September 2021 during works to determine the cause of slumping within the nave of the church. Two trenches were excavated over the areas of greatest subsidence.

Download the data management plan

9 Practical Implementations

Now that we have explored the underpinnings of a data management plan, let's consider some of the practical implementations of data management planning.

9.1 Understand your project requirements

Different funders and institutions have different requirements for research projects, more generally, and data management, more specifically. As you consider and create your DMP make sure to research these requirements and even link to them in your DMP so they are easy to find (sometimes it can be challenging to even find them)!

9.2 Consult, collaborate and seek advice from appropriate stakeholders

For large research projects you may need to consider the requirements of collaborators or multiple funders. It's important to seek advice and consult with these groups early so that all your requirements are met (see above), but also so you understand which organisations are responsible for what aspects of your data management (see below).

9.3 Understand your existing support and infrastructure provision

As research institutions, Universities usually have dedicated teams to assist your research projects, whether that is compiling and submitting your research funding applications or assisting with data management plans. Research or IT Services (each University tends to have a unique name for this department) often provides information about the latest advice and requirements for data management and, in some instances, will review your DMPs.

9.4 Be able to clearly define the roles and responsibilities within your project

For a DMP it is really useful to, as in any project management, be able to identify specific people whose responsibility it is to manage and document your research data. As a shared document from across your research project team, this ensures everyone is clear on who does what and that nothing is forgotten as your progress. But remember, sometimes project staff change, so do remember to update your plan accordingly.

9.5 Be prepared to implement your plan

Make your plan straightforward and simple enough that if you are fortunate enough to win your project funding that it is easy to implement your data

management plan. If your plan is overly complicated it may take time to figure out all the intricacies of your project and in the meantime you may overlook data being created as you start your research.

Remember, a DMP:

- Is a collaborative process, between the Research team and institutional IT/Research teams
- Should link into existing policies, such as funding requirements, IPR policies, IT security and storage information
- Should be concise! Funding applications only provide limited space for this information
- Should be flexible! DMP requirements vary between organisation and funder.
- Can be made easy by using tools for data management planning (see below)!

9.6 Plan to Reuse your data

Planning for reuse is a useful strategy in both data management planning and considering the long term preservation of your research data.

> "The single most useful thing you can do to ensure the long-term preservation of your data is to plan for it to be reused. Imagining it being re-used by someone else who has never met you and who never will meet you, will cause you to approach the creation and design of your data in a new light." **Prof. Julian Richards, Director Archaeology Data Service**

9.7 Useful Tools

9.7.1 DMP Online

A useful tool for creating data management plans is DMP Online, which helps you to "create, review, and share data management plans that meet institutional and funder requirements".

It's free to use and you can login via your institutional accreditation.

What does it offer?

- Templates to suit both funder and institutional requirements
- The ability to share plans with collaborators (within and beyond your institution)
- A number of publicly accessible exemplars
- A really useful resource list for data management planning

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10 Exercise 2 - Create your own Data Management Plan

Now that we are more familiar with DMPs it's now time to think about writing your own. Before you get started with your own project it may be useful to consider a hypothetical situation.

Read the summary of this fictitious project below. This outline was created by ChatGPT! Next take a section of the data management plan and consider:

- What would I include in this section of the DMP for this project?
- What considerations would I need to make in taking into account the intricacies of this large scale research project?
- How can I make the DMP as useful as possible to the project team?

Project title: "Medieval Mysteries: Excavating the Ruins of Tintagel Castle"

Description: Investigating the legendary Tintagel Castle, this project delves into medieval history and Arthurian legends. Archaeologists aim to uncover clues about the inhabitants' daily lives, trade connections, and the castle's role in the context of Arthurian lore.

Methods:

- Tracing Trade Connections: The project focuses on Tintagel's role as a medieval trade hub, utilising artefact examination to trace economic networks and connections with other regions.
- Contextualising Arthurian Lore: Archaeologists will scrutinise castle structures and artefacts to identify elements aligning with Arthurian legends, seeking to uncover tangible links to the mythical narrative.
- Architectural Insights: A detailed analysis of Tintagel's architecture aims to reconstruct the castle's historical layout and functionality, providing insights into its evolving role in medieval society.
- Public Engagement and Outreach: Recognizing public interest, the project emphasises outreach activities and digital media to share discoveries, fostering a broader appreciation for Tintagel's medieval heritage.

Tintagel Castle: Kerry Garratt, CC BY-SA 2.0, via Wikimedia Commons

10.1 DMP Sections you could pick!

- Roles and responsibilities
- Data Description
- Standards and Methods
- Ethics and IPR
- Sharing and Security
- Preservation and Access

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Look back to the section on Research Data Management and the example DMPs from Exercise 1 for details about what each of these sections should contain.

11 Tips and Tricks

So you are now ready to jump into the world of data management and prepare data management plans for your next research project. But before you go we have a few tips and tricks that may be useful in your research data management journey.

11.1 Act early - Think about and plan for data management early

- Plan from the outset of your project rather than leaving it to the last minute
- Consider the resources and time that it will take to properly manage your data
- Prepare a data management plan early and update it regularly throughout the project
- Contact your chosen data repository early for assistance including on appropriate data types and cost

11.2 Find a repository - Discover the most suitable repository for your data

- Use a trusted and accredited repository, ideally one that is Core Trust Seal certified
- Think discipline specific (if possible)
- Utilise a repository directory to find your repository such as Re3data or Open DOAR, a Global Directory of Open Access Repositories

11.3 Get an ORCID- Adopt a personal persistent identifier

- An ORCID is a personal persistent identifier distinguishes you and makes sure that your research outputs are correctly attributed to you in one place
- It has name flexibility, is customizable and portable between institutions
- Automatically linked to (trusted) publication databases
- It also is linked to your grant applications

11.4 Think Open Access - Plan for your research to be as open (as possible)

- As we've seen the Research environment increasingly moving towards Open research including open access, open data and open methods
- Although highly useful, being open with your research is not always as straightforward as it could be. Think early so that you consider the financial and administrative costs to your project
- Being open is not always suitable for all the datasets or articles that you produce during your research (e.g. personal data) but consider being as open

as you can and publishing at least partly open, even if it’s not everything.

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Resources for Data Management

There are a number of excellent resources available that provide information about data management as it relates to academic research and archaeology more specifically.

Archaeology Data Service - Data Management

Our own guidance on data management best practice for data creators including specific information on management ahead of data deposition with a digital repository, particularly in the UK.

Ariadne Research Infrastructure - Guide for Archaeological Data Management Planning

A series of online tools to assist archaeologists who want to create a data management plan, with specific focus on European research Projects and the requirements for projects funded by the European Commission.

Chartered Institute for Archaeologists - Dig Digital

A comprehensive set of resources to support those creating digital data in archaeology, enabling the production of complete, ordered and stable archives that meet professional standards. This resource is geared towards professional archaeologists and links to existing CIfA standards.

DMPonline - Data Management Planning Resources

DMPonline helps you to create, review, and share data management plans that meet institutional and funder requirements. This page of resources links to useful resources on data management including example data management plans.

The Turing Way - The Turing Way: A handbook for reproducible, ethical and collaborative research

The Turing Way handbook is a collection of community-developed guides on data science practices including Reproducible Research, Project Design, Communication, Collaboration and Ethical Research. Focuses specifically on data science, these guides provide useful resources for all researchers within academia and beyond.

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